Jun 11th, 11:00 AM - 11:20 AM

Thinking Outside the Box Culvert, Floodplain Management and Urban Stream Rehabilitation

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International Conference on Engineering and Ecohydrology for Fish Passage "Thinking Out Side the Box Culvert" Floodplain Management and Urban Stream Rehabilitation

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mmsd

Preserving The Environment • Improving Water Quality

Floodplain Managers On the Job Training

What is Flood Management?

Flooding is a natural process that becomes problematic if property and life are put in the path of disaster!

THEREFORE:

Floodplain management is a decision making process for wise use of the Existing Floodplain based on all costs and benefits

Current National Flood Management Policy

- **Promotes construction in high risk areas**
- **Ignores Climate Change**
- **FIRMs are old, inaccurate, or nonexistent**
- **Undervalues natural resources and floodplain functions**
- **Transfer of who pays for Risk (FEMA $25 B in Debt)**
- **Cycle of Disaster, Disaster Assistance, rebuild, Disaster**
- **Then Came the Bi-Op**

NMFS Biological Opinion

2003 - NWF sues FEMA for failure to comply with ESA (Puget Sound Salmon and Orcas)
2004 - Court ruled FEMA must consult NMFS
2006 - FEMA provided a Biological Opinion NFIP might affect but not adversely impact ESA
2008 -NMFS issues Biological Opinion with Jeopardy and Modification (NFIP has adverse impact)
Could be a game changer.
Requires communities to consider impacts to fish and natural resources when issuing floodplain and building permits or to property that could impact the floodplain

New Approach for Flood Management

Make Room for Rivers to safely accommodate floods.

Old Grey Strategy

- Large, expensive projects long term
- Undervalues Eco-Services
- High Energy Inputs
- High O & M Costs
- Weakens with time
- Not Adaptable to Climate Change
- High Residual Risk (fails catastrophically)
- Generally Harmful to Environment
- Protects People

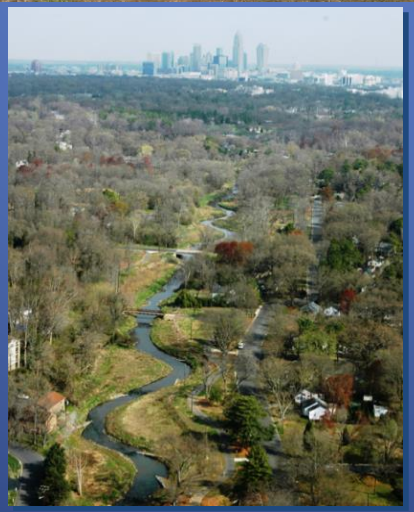
New Green Strategy

- Inexpensive projects long term
- Values Eco System Services
- Low energy inputs
- Low O & M Costs
- Strengthens with time
- Adaptable to Climate Change (Resilient)
- Low residual Risk (no catastrophic failure
- Works with or mimics environment
- Protects People and Environment

Make Room for the River (RvR) began as idea in 1986, gained momentum in 1990s, US projects as inspiration

Netherlands Embassy

Reconnecting the River…



- **Protect**: Floodplain acquisition through buyouts and relocations to restore beneficial functions of floodplains, establish greenways, parks, recreational space.

Restore: Setting levees back, retiring sensitive agricultural lands, and restoring riparian vegetation increases storage.

- **Replicate**: Implementing green infrastructure and working with nature reduces flood flows and enhance water quality.

Naturally Functioning Floodplains:

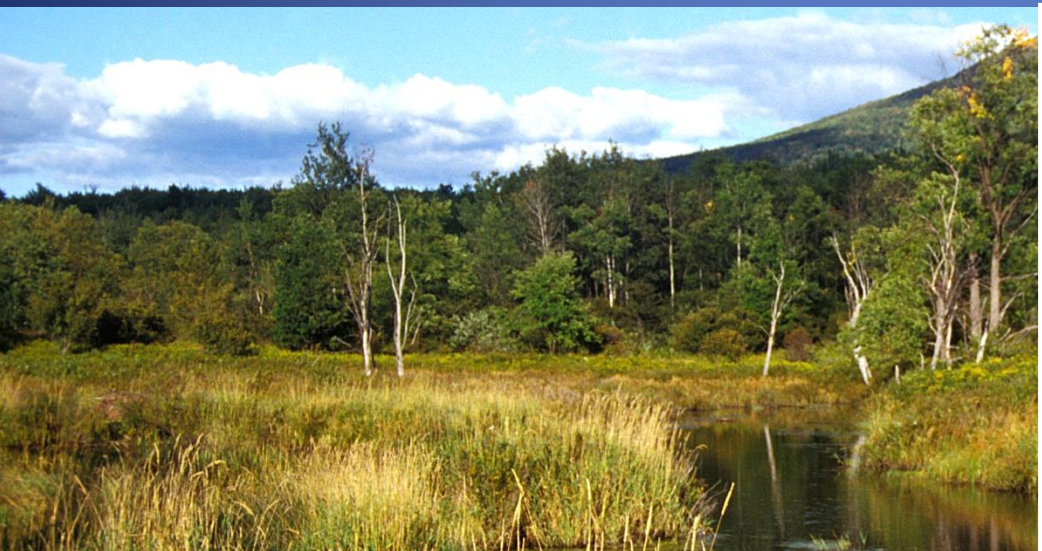
PEOPLE

- ✓ Reliable water supplies
- ✓ Protection of health
- ✓ Safety from storms and failing infrastructure
- ✓ Quality of life – recreation, aesthetics, quiet solace
- ✓ Economic security
- ✓ Community stability

ECOSYSTEMS

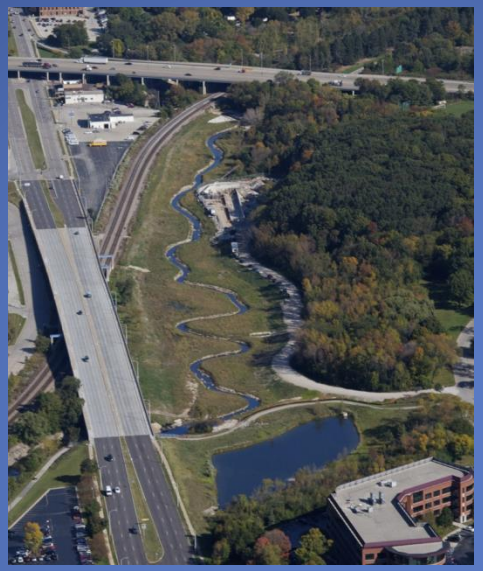
- ✓ Diversity of habitats
- ✓ Diversity of species
- ✓ Migratory corridors
- ✓ Refuge from disturbances
- ✓ Natural, dynamic flows trigger reproductive cues
- ✓ Protection of species health – especially from toxics

Despite representing <2% of Earth's land surface area, floodplains are 2nd to estuaries in the value to society providing ~25% of all terrestrial ecosystem service benefits.



Areas of Progress Sustainable Green Flood Management (Make Room for the River)

Boulder, CO
Milwaukee, WI
Charlotte, NC
Otter Creek, VE
Portland, OR
Denver, CO
Napa, CA
Ottawa, IL
Pierce County, OR
Sacramento, CA
Seattle, WA



Local Milwaukee Issues Stormwater and Flooding Issues What Are We Doing

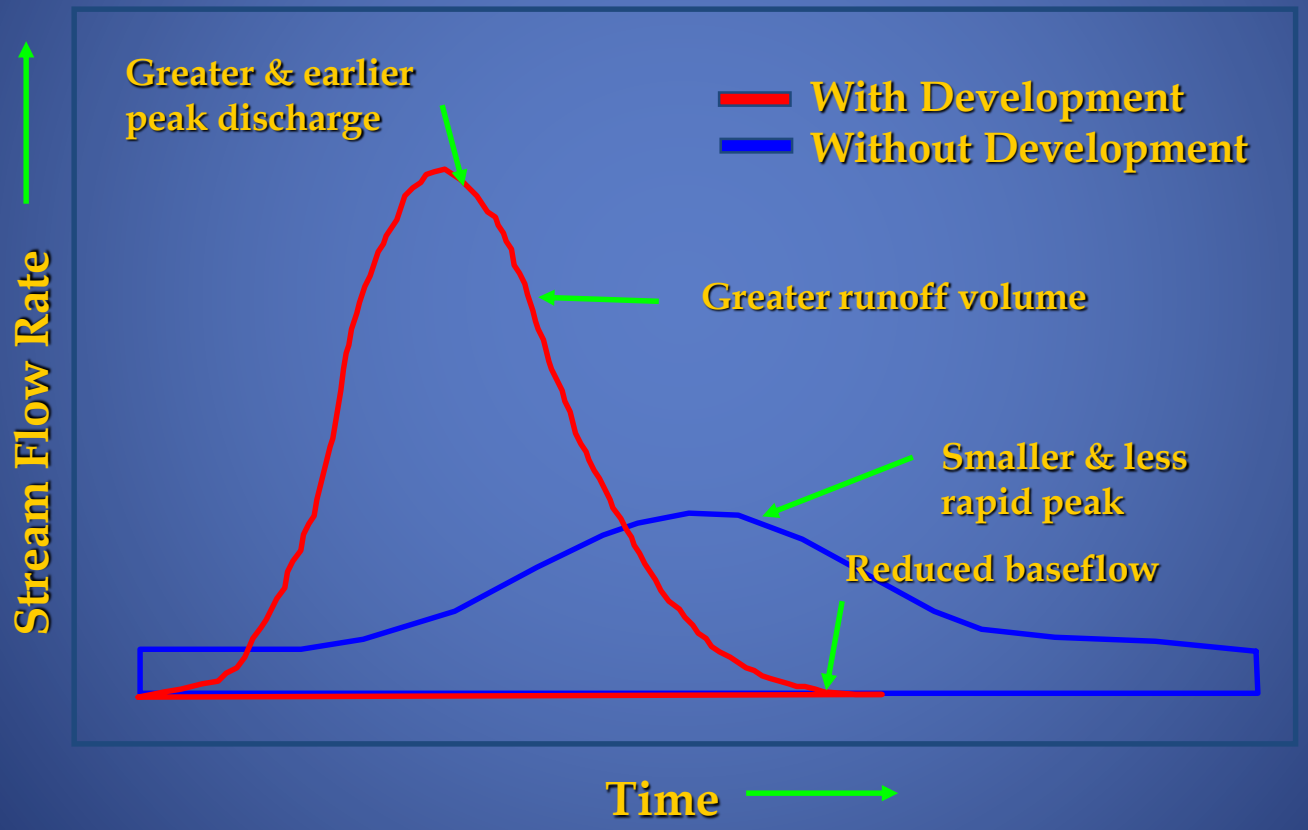
Rivers and Channels in Milwaukee

1. Water Quality and Quantity Issues
2. Historic Channelization, Agriculture and water quality
3. Over 30 miles of concrete channels
4. Close to 100 miles of channelized channel (WPA walls
5. Role of CSOs, SSOs and Stormsewer Systems
6. Restoring Resiliency to the system.
7. Are we doing it right?

Urban Channel Issues

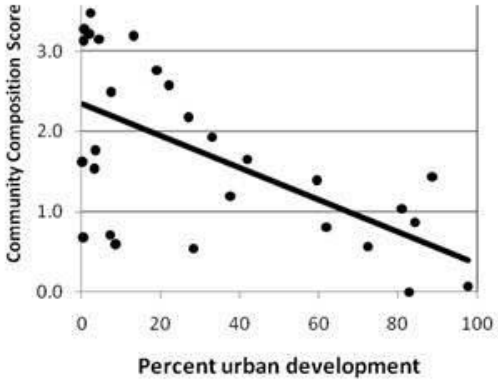
1. Public Safety
2. Increased flashiness and flooding (upstream development and changing rain patterns)
3. Public perception of the Concrete
4. Long term Operation and Maintenance Management Strategy for vegetation and sediment both along and in channel
5. Utilities (Bridges, Outfalls, Gas and Electrical Crossings, and water utility pipes).
6. Concrete Channel Repair ($50,000 - $250,000 for repairs)
7. Concrete Replacement Costs ($1500-2000/LF)

Hydrology and Hydraulics Impacts of Development on Streams

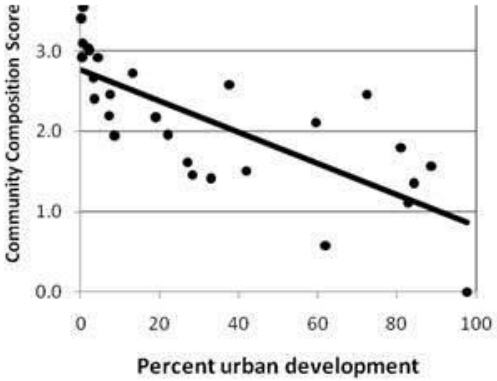


Ecological Response to Increased Watershed Development from

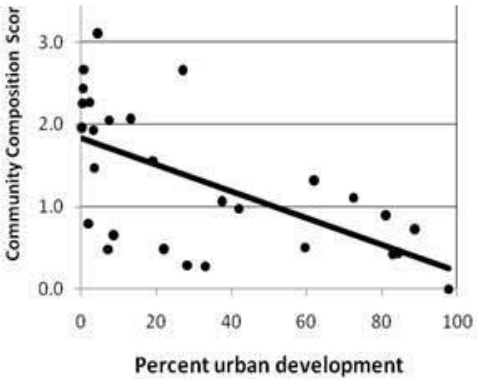
Algal Communities



Aquatic Insect Communities



Fish Communities



USGS

Sediment Transport & Altered Stream Geomorphology

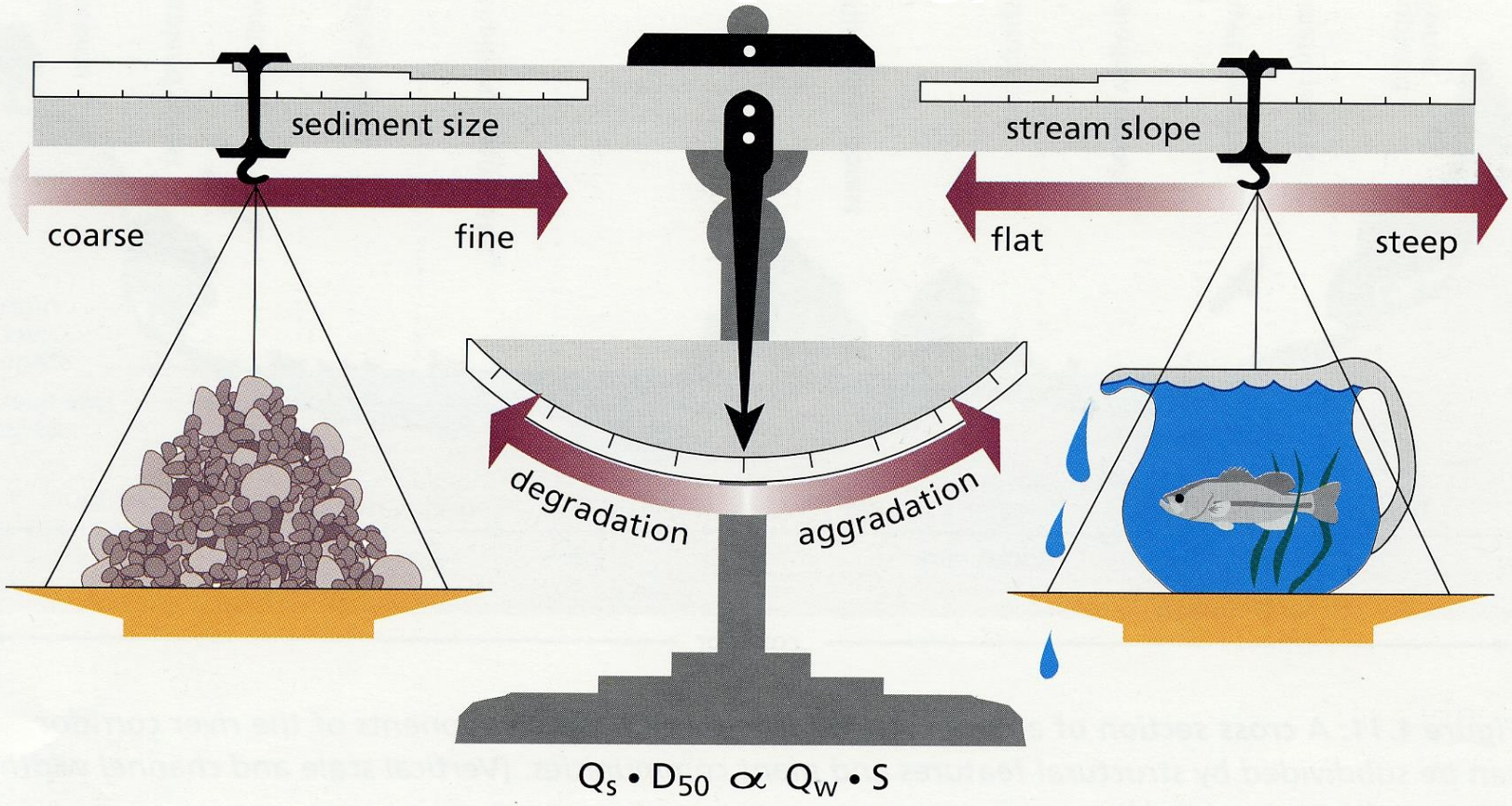


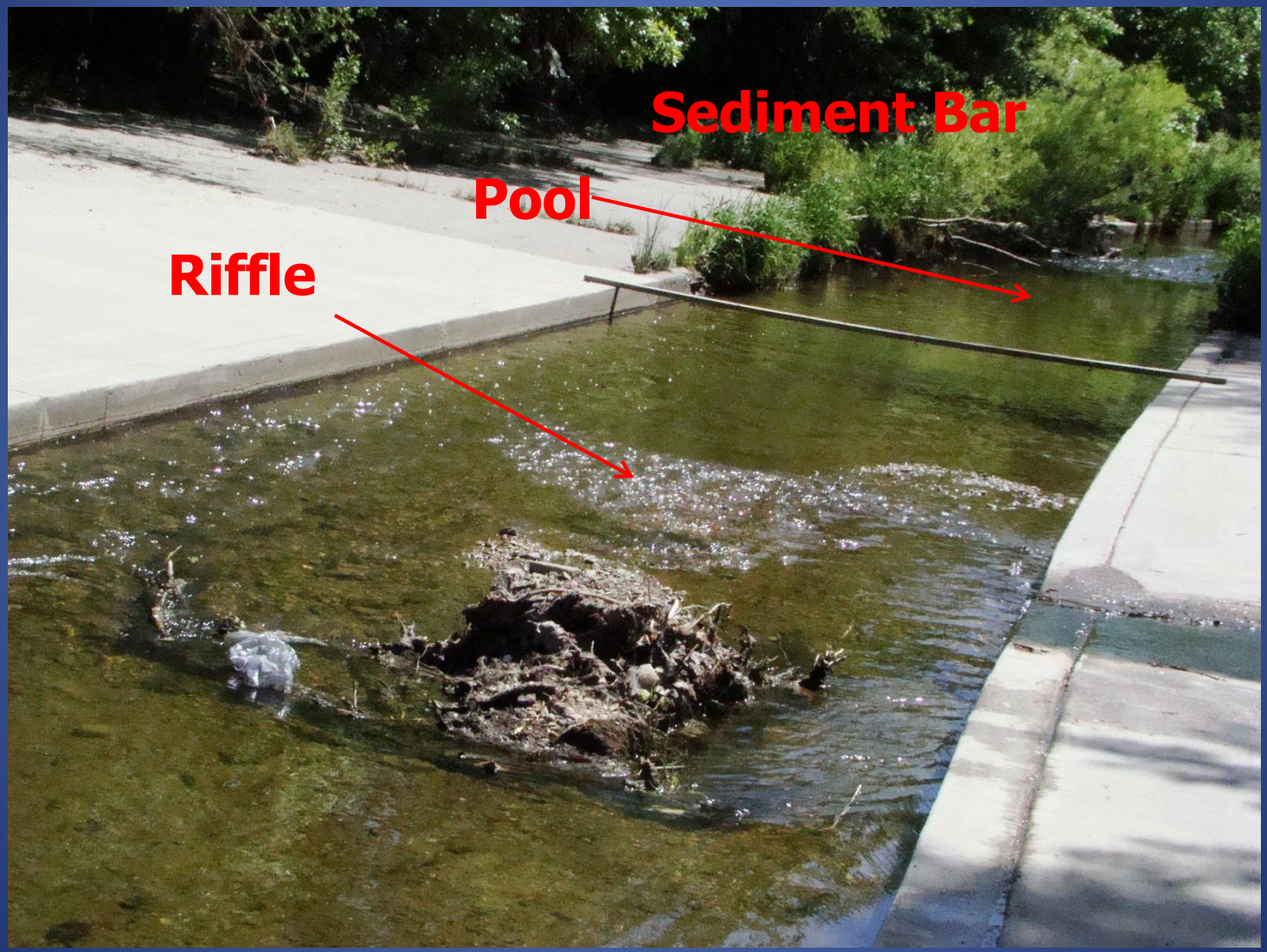
Figure 1.13: Factors affecting channel degradation and aggradation. *The "size" of the channel is determined by the stream's energy, the slope, and the flow of water in balance with the size and quantity of the sediment particles the stream moves.*

Source: Rosgen (1996), from Lane, ***Proceedings***, 1955. Published with the permission of American Society of Civil Engineers.

Aging Concrete Channel Failures

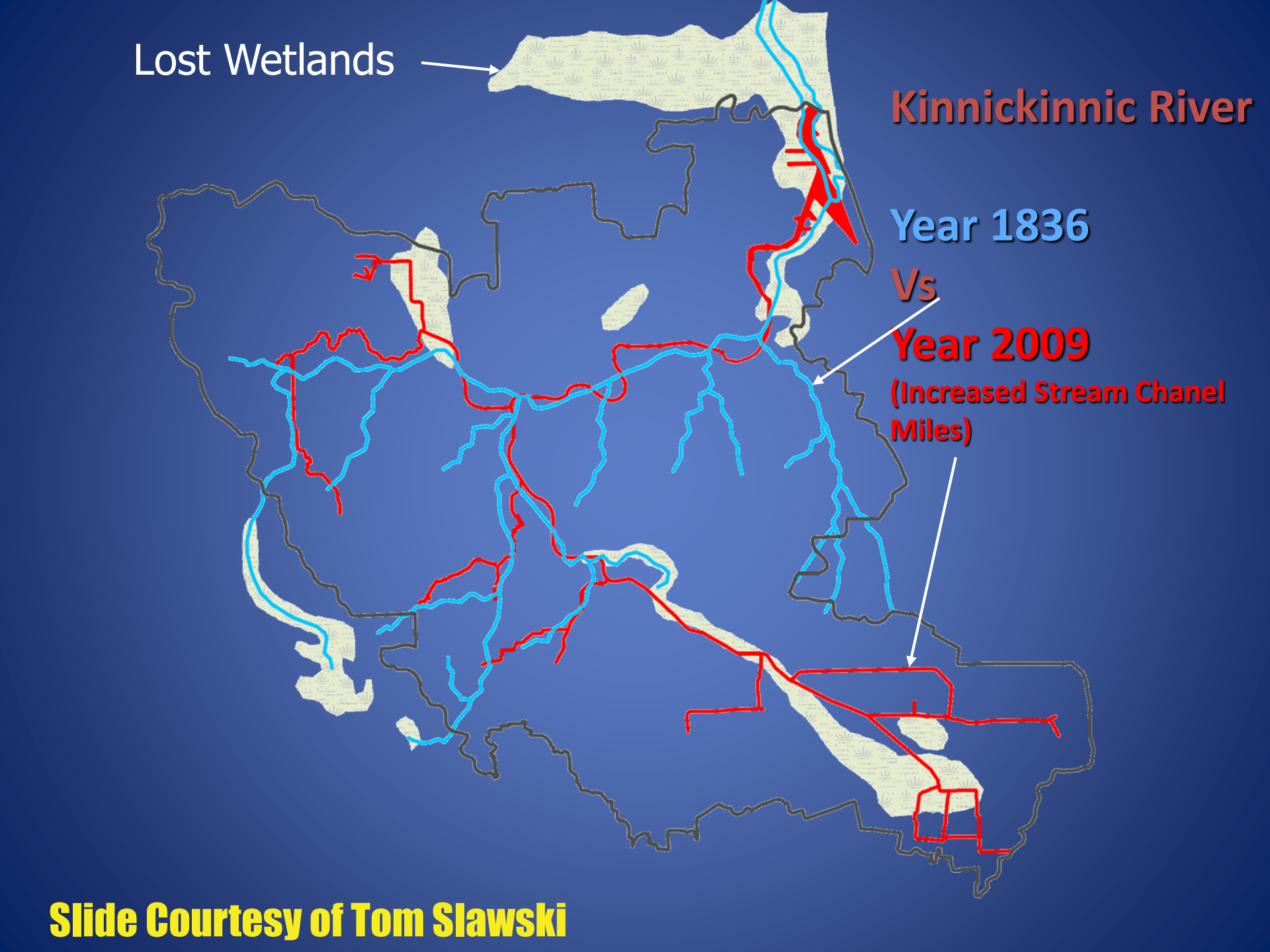
Channel Vegetation/Sediment Issues

Pool Riffle Sequence in Concrete Channel



Kinnickinnic River Watershed

Was voted one of the top ten worst rivers in North America in 2007



Slide Courtesy of Tom Slawski

KK River Historic Channel Before Concrete Channel (channelization already evident)

KK River Flooding March 1960 (12th Street)

KK River @ 6th Street After Concrete

Concrete “improved” Channel Encouraged Development in the High Risk Floodplain


Kinnickinnic River
9th Place and Cleveland
June 7, 2008 (50 Year Flood)

KK Flood Management Project

- Make Room for the River Concept
- Reduce Flood Risk (300 Properties) & Improve Public Safety
- Project will remove 12,000 LF of concrete channel liner
- Improved Stream Functions Including Fish Passage
- Voluntary Acquisition of 85 Properties (w/structures)
- Neighborhood Plan (to off set Property Tax Loss)
- Deconstruction (of acquired structures) Project
- Sediment transport and Geomorphology Study
- Estimated cost $60-70 Million

Kinnickinnic River Vision

New 6th St. Bridge and Rehabilitated KK Channel

Before

Rehabilitated KK Channel (Near Expressway)

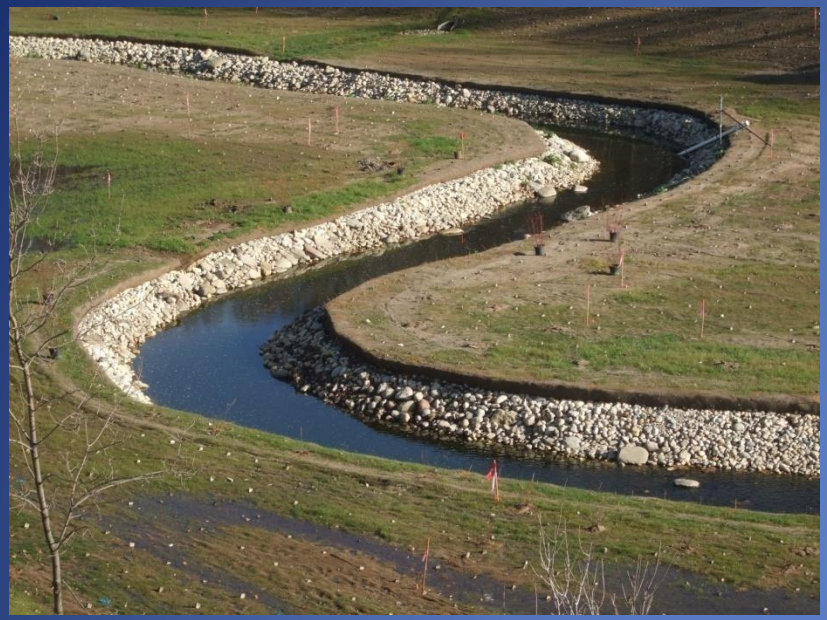
Before

Underwood Creek

Underwood Creek Construction

Underwood Creek Construction

Underwood Creek Construction 2009



Underwood Creek 2010

Existing Conditions

Questions